shoulder. This information is fed to the seatbelt anchorage height adjustment system **528**, shown schematically, which moves the attachment point **529** to the optimum vertical location.

[**0272**] 10. Resonators

[**0273**] Acoustic or electromagnetic resonators are devices that resonate at a preset frequency when excited at that frequency. If such a device, which has been tuned to 40 kHz for example, or some other appropriate frequency, is subjected to radiation at 40 kHz it will return a signal that can be stronger than the reflected radiation. If such a device is placed at a particular point in the passenger compartment of a vehicle, the returned signal can be easily identified as a high magnitude narrow signal at a particular point in time that is proportional to the distance from the resonator to the receiver. Since this device can be easily identified, it provides a particularly effective method of determining the distance to a particular point in the vehicle passenger compartment (i.e., the distance between the location of the resonator and the detector). If several such resonators are used they can be tuned to slightly different frequencies and therefore separated and identified by the circuitry. Using such resonators, the positions of various objects in the vehicle can be determined In **FIG. 14**, for example, three such resonators are placed on the vehicle seat and used to determine the location of the front and back of the seat and the top of the seat back. In this case, transducers **231** and **232**, mounted in the A-pillar **662**, are used in conjunction with resonators **641**, **642** and **643** to determine the position of the seat. Transducers **231, 232** constitute both transmitter means for transmitting energy signals at the excitation frequencies of the resonators **641**, **642**, **643** and detector means for detecting the return energy signals from the excited resonators. Processor **101** is coupled to the transducers **231, 232** to analyze the energy signals received by the detectors and provide information about the object with which the resonators are associated, i.e, the position of the seat in this embodiment. This information is then fed to the seat memory and adjustment system, not shown, eliminating the currently used sensors that are placed typically beneath the seat adjacent the seat adjustment motors. In the conventional system, the seat sensors must be wired into the seat adjustment system and are prone to being damaged. By using the vehicle interior monitoring system alone with inexpensive passive resonators, the conventional seat sensors can be eliminated resulting in a cost saving to the vehicle manufacturer. An efficient reflector, such as a parabolic shaped reflector, or in some cases a corner cube reflector (which can be a multiple cube pattern array), can be used in a similar manner as the resonator. Similarly, a surface acoustic wave (SAW) device, RFID, variable resistor, inductor or capacitor device and radio frequency radiation can be used as a resonator or a delay line returning a signal to the interrogator permitting the presence and location of an object to be obtained as described in detail in U.S. patent application Ser. No. 10/079,065 which is incorporated herein in its entirety by reference.

[**0274**] Resonators or reflectors, of the type described above can be used for making a variety of position measurements in the vehicle. They can be placed on an object such as a child seat (see **FIG. 2**) to permit the direct detection of its presence and, in some cases, its orientation. These resonators are made to resonate at a particular frequency. If the number of resonators increases beyond a reasonable number, dual frequency resonators can be used. A pair of frequencies is then used to identify a particular location. Alternately, resonators tuned to a particular frequency can be used in combination with special transmitters, which transmit at the tuned frequency, which are designed to work with a particular resonator or group of resonators. The cost of the transducers is sufficiently low to permit special transducers to be used for special purposes. The use of resonators that resonate at different frequencies requires that they be irradiated by radiation containing those frequencies. This an be done with a chirp circuit.

[**0275**] An alternate approach is to make use of secondary emission where the frequency emitted form the device is at a different frequency that the interrogator. Phosphors, for example, convert ultraviolet to visible and devices exist that convert electromagnetic waves to ultrasonic waves. Other devices can return a frequency that is a sub-harmonic of the interrogation frequency. Additionally, an RFID tag can use the incident RF energy to charge up a capacitor and then radiate energy at a different frequency.

[**0276**] Another application for a resonator of the type described is to determine the location of the seatbelt and therefore determine whether it is in use. If it is known that the occupants are wearing seatbelts, the airbag deployment parameters can be controlled or adjusted based on the knowledge of seatbelt use, e.g., the deployment threshold can be increased since the airbag is not needed in low velocity accidents if the occupants are already restrained by seatbelts. Deployment of other occupant restraint devices could also be effected based on the knowledge of seatbelt use. This will reduce the number of deployments for cases where the airbag provides little or no improvement in safety over the seatbelt. **FIG. 15**, for example, shows the placement of a resonator **602** on the front surface of the seatbelt where it can be sensed by the transducers **231** and **232**. Such a system can also be used positively identify the presence of a rear facing child seat in the vehicle. In this case, a resonator **603** is placed on the forward most portion of the child seat, or in some other convenient position, as shown in **FIG. 1A**. As illustrated and discussed in U.S. patent application Ser. No. 10/079,065, there are various methods of obtaining distance from a resonator, reflector, RFID or SAW device which include measuring the time of flight, using phase measurements, correlation analysis and triangulation.

[**0277**] Other uses for such resonators include placing them on doors and windows in order to determine whether either is open or closed. In **FIG. 16A**, for example, such a resonator **604** is placed on the top of the window and is sensed by transducers **611** and **612**. In this case, transducers **611** and **612** also monitor the space between the edge of the window glass and the top of the window opening. Many vehicles now have systems that permit the rapid opening of the window, called "express open", by a momentary push of a button. For example, when a vehicle approaches a tollbooth, the driver needs only touch the window control button and the window opens rapidly. Some automobile manufacturers do not wish to use such systems for closing the window, called "express close", because of the fear that the hand of the driver, or of a child leaning forward from the rear seat, or some other object, could get caught between the window and window frame. If the space between the edge of the window and the window frame were monitored with